Passive Equilibrium Sampling of Hydrophobic Organic Contaminants in Sediment

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TH065 Passive Equilibrium Sampling of Hydrophobic Organic Contaminants in Sediment A. Jahnke, Stockholm University / Department of Applied Environmental Science ITM; K.A. Maenpaa, University of Eastern Finland / Department of Biology; S. Schaefer, Federal Institute of Hydrology / Biochemistry Ecotoxicology; P. Mayer, Technical University of Denmark / Department of Environmental Engineering. Hydrophobic organic contaminants (HOCs) reaching the aquatic environment are largely stored in sediments. The exposure risk of contaminated sediments is challenging to assess since traditional exhaustive extraction methods capture both the freely dissolved and the bound fractions. Contrarily, only the freely dissolved concentration (C_{free}) represents the bioavailable fraction and effective concentration for diffusive uptake and partitioning. Passive equilibrium sampling approaches can deliver C_{free}: A range of silicone-based formats have been described, e.g. glass jars with µm-thin silicone coatings on the inner vertical walls for equilibration in the laboratory [1] and a device housing a number of silicone-coated fibers for *in situ* equilibration [2]. In both cases, the parallel sampling with varying silicone thicknesses can be applied to indicate valid equilibrium sampling, avoiding tedious time series measurements. The measured equilibrium partitioning concentrations in the silicone (C_{Sil}) can be used directly, e.g. for the assessment of spatial trends or comparison with C_{Sil} from other media such as biota [3]. Furthermore, C_{Sil} can be divided by silicone/water partition ratios [4] to yield C_{free}. In order to assess HOC levels in biota, C_{free} can be multiplied with bioconcentration factors (BCFs) to predict concentrations in benthic organisms [5], but the uncertainties in BCF determination also apply to these predictions. A more accurate approach is to calculate concentrations in model lipids at thermodynamic equilibrium with the sediment ($C_{Sed,lip}$) as the product of C_{Sil} and lipid/silicone partition ratios [6], which has been done in several studies with limnic and marine sediments [3,7-8]. The $C_{Sed,lip}$ data can then be compared with lipid-normalized concentrations in aquatic organisms or regulatory thresholds. Silicone-based passive equilibrium sampling has proven to be a straightforward, precise and sensitive approach to determine the effective concentrations of HOCs relevant in risk assessment that may be useful for sediment management decision-making. **References**. [1] Reichenberg et al. *Chem. Cent. J*. **2008** 2:8; [2] Witt et al. *Environ. Sci. Technol*. **2013** 47:7830; [3] Jahnke et al. *under revision*; [4] Smedes et al. *Environ. Sci. Technol*. **2009** 43:7047; [5] Kraaij et al. *Environ. Sci. Technol*. **2003** 37:268; [6] Jahnke et al. *Chemosphere* **2008** 73:1575; [7] Mäenpää et al. *Environ. Sci. Technol*. **2011** 45:1041; [8] Jahnke et al. *Environ. Sci. Technol*. **2012** 46:10114.